Using GPS measurements to solve tectonic behavior of western segment of the Makran Subduction Zone, Iran

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Abstract

The east-west-trending Makran subduction is situated between two roughly NS oriented fault systems, the left-lateral Chaman-Ornach-Nah fault system to the east (inside Pakistan) and the right-lateral Minab-Zendan fault system to the west (inside Iran). The eastern segment of the Makran subduction zone experiences larger earthquakes than the western segment, as documented for example by the 2013 Mw= 7.8 earthquake close to Khash (SE Iran). This event was an intermediate depth intra-plate earthquake with normal-faulting mechanism. The contrasting apparent aseismic behavior of the western Makran and its potential as a source for future great tsunamigenic earthquakes are still a subject of debate. Three possible kinematic models are suggested: first, the entire western segment is mostly slipping aseismically; second, the subduction process is no longer active on this segment and third, the western segment is locked and is capable of generating a plate boundary earthquake. However, the Iranian permanent GPS network (IPGN) established around the Makran subduction zone shows that the subduction process is active. The oceanic crust of Arabian plate is subducting with 2cm/yr beneath the Eurasian plate and this rate increases from west to east. The GPS measurements also show that the Makran subduction zone is relatively locked. We propose to investigate whether the Makran subduction zone experiences silent earthquakes that release the cumulated seismic energy, using a GPS timeseries analysis.

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